

CLAIMS

1. A process for manufacturing bake hardening steel sheet comprising:

5 - the smelting of a steel, the composition of which comprises, expressed in % by weight:

$$0.03 \leq C \leq 0.06$$

$$0.50 \leq Mn \leq 1.10$$

$$0.08 \leq Si \leq 0.20$$

10  $0.015 \leq Al \leq 0.070$

$$N \leq 0.007$$

$$Ni \leq 0.040$$

$$Cu \leq 0.040$$

$$P \leq 0.035$$

15  $S \leq 0.015$

$$Mo \leq 0.010$$

$$Ti \leq 0.005$$

it being understood that the steel also contains boron in an amount such that:

20  $0.64 \leq \frac{B}{N} \leq 1.60$

the balance of the composition consisting of iron and impurities resulting from the smelting;

25 - the casting of a slab of this steel, this slab then being hot rolled in order to obtain a sheet, the end-of-rolling temperature being above that of the Ar<sub>3</sub> point;

- the coiling of said sheet at a temperature of between 500 and 700°C; then

30 - the cold rolling of said sheet with a reduction ratio of 50 to 80%;

- a continuous annealing heat treatment which is carried out for a time of less than 15 minutes; and

- a skin pass which is carried out with a reduction ratio of between 1.2 and 2.5%.

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2. The process as claimed in claim 1, characterized in that said continuous annealing heat treatment comprises:

- a reheat of the steel until it reaches a temperature of between 750 and 850°C;
- an isothermal soak;
- a first cooling operation down to a temperature  
5 of between 380 and 500°C; and
- an isothermal soak; and then
- a second cooling operation down to the ambient temperature.

10 3. The process as claimed in either of claims 1 and 2, characterized in that said first cooling operation comprises a slow first part carried out at a rate of less than 10°C/s, followed by a rapid second part carried out at a rate of between 20 and 50°C/s.

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4. The process as claimed in any one of claims 1 to 3, characterized in that, in addition, the manganese content and the silicon content of the steel are such that:

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$$4 \leq \frac{\%Mn}{\%Si} \leq 15.$$

25 5. The process as claimed in any one of claims 1 to 4, characterized in that, in addition, the manganese content of the steel is between 0.55 and 0.65% by weight and the silicon content of the steel is between 0.08 and 0.12% by weight.

30 6. The process as claimed in any one of claims 1 to 4, characterized in that, in addition, the manganese content of the steel is between 0.95 and 1.05% by weight and the silicon content of the steel is between 0.16 and 0.20% by weight.

35 7. The process as claimed in any one of claims 1 to 6, characterized in that, in addition, the nitrogen content of the steel is less than 0.005% by weight.

8. The process as claimed in any one of claims 1 to 7, characterized in that, in addition, the phosphorus content of the steel is less than 0.015% by weight.

5 9. A bake hardening sheet that can be obtained by the process as claimed in any one of claims 1 to 8, characterized in that it has a yield strength of between 260 and 360 MPa, a tensile strength of between 320 and 460 MPa, a BH2 value of greater than 40 MPa and  
10 a yield plateau of less than or equal to 0.2%.

10. The sheet as claimed in claim 9, characterized in that it has, in addition, a BH2 value of greater than 60 MPa.

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11. A part that can be obtained by cutting a blank from a hardening sheet as claimed in claim 9 or 10, said blank then being painted and baked at less than 200°C.